

## Fieldwork

# Gas-Hydrate Research Wells Completed in the Canadian Arctic

By Bill Winters

Three 1,200-m-deep wells—a main production research well and two nearby scientific observation wells—were recently drilled in the Mackenzie Delta region of the Northwest Territories, Canada, to explore the presence of subpermafrost gas hydrate. This project was one of the most complex, expensive, and daring undertakings to explore natural-gas hydrate, a crystalline solid composed of individual gas molecules trapped within cages formed by hydrogen-bonded water molecules. Most of the cages contain a single gas molecule—typically, but not limited to, methane in the natural setting.

Gas hydrates have been of global interest for much of the past decade because of their potential impact on energy reserves, global climate change, continental-margin slope stability, and petroleum-drilling hazards. High pressures and low temperatures, associated with many continental margins and Arctic regions, can form gas hydrate in the presence of an adequate supply of certain gas molecules and water.

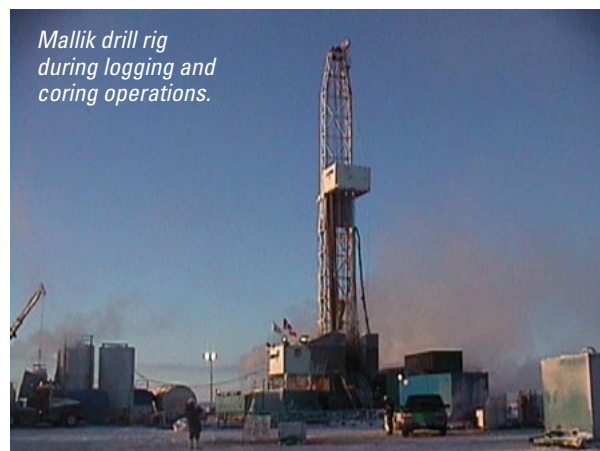
The drilling project, involving more than 60 scientists and engineers and 250 support staff from six countries, overcame huge logistical problems compounded by the drillsite's extremely remote location and harsh winter conditions, including temperatures below  $-40^{\circ}\text{C}$ . The drill holes, spaced 40 m apart, were located in the Mallik gas-hydrate field next to the Beaufort Sea on the northern part of Richards Island, and were near the Mallik 2L-38 well drilled in 1998. All major equipment was delivered by way of a project ice road constructed on the frozen Mackenzie River. Overall scientific leadership and responsibility were provided by **Scott Dallimore** (Geological Survey of Canada, Sidney, British Columbia), and the principal investigators were **Tim Collett** (USGS Energy Team, Denver,



*Mallik drill site, northern Mackenzie Delta, Northwest Territories, Canada. The ice road (lower right) enabled supplies and personnel to be brought to the site. Photograph by **Suzanne Weedman**.*

CO), **Takashi Uchida** (Japan Petroleum Exploration Co., Chiba, Japan), and **Michael Weber** (GeoForschungsZentrum, Potsdam, Germany). The Japan Petroleum Exploration Co. coordinated drilling activities. Other organizations involved in the project included Canada's University of Ottawa and University of Alberta; the United States' Department of Energy (DOE), Idaho National Environmental and Engineering Laboratory, Lamont-Doherty Earth Observatory, Pacific Northwest National Laboratory (PNNL), and Lawrence Berkeley National Laboratory; Japan's University of Tokyo and Japan National Oil Corp.; and India's Oil and Natural Gas Corp.

The recently completed Mallik project consisted of several different phases. Drill-



*Mallik drill rig during logging and coring operations.*

ing of the first observation well began on Christmas Day. One after the other, the two observation wells were drilled and instrumented with fiber-optic temperature sensors; then the main well was begun. The 640-m-deep permafrost section in the main well was drilled and cased before

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## Sound Waves

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## Submission Guidelines

**Deadline:** The deadline for news items and publication lists for the May issue of *Sound Waves* is Monday, April 22.

**Publications:** When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.

**Images:** Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator® files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

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## U.S. Geological Survey Earth Science Information Sources:

Need to find natural-science data or information? Visit the USGS Frequently Asked Questions (FAQ's) at URL <http://ask.usgs.gov/faqs.html>

Can't find the answer to your question on the Web? Call 1-888-ASK-USGS

Want to e-mail your question to the USGS? Send it to this address: [ask@usgs.gov](mailto:ask@usgs.gov)

## Fieldwork, continued

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the start of continuous coring, which completely penetrated the gas-hydrate section between about 890-m and 1,150-m depth. Because recovery of sediment cores containing gas hydrate was extremely good, more than 50 pressure vessels and four liquid-nitrogen dewar flasks were filled to capacity. Other aspects of the project consisted of well logging, downhole temperature profiling, microbiologic studies, seismic crosshole tomography (yielded information about sediment density and elastic properties), and the first intentional production tests of a gas-hydrate reservoir involving both pressure drawdown and thermal stimulation. These last tests were conducted to determine the relation between pressure reduction and dissociation of in-place gas hydrate, and to measure gas release for a given input of thermal energy.

**Bill Winters** (Woods Hole Field Center) was responsible for determining the physical properties of cored sediment and making infrared temperature measurements of freshly obtained sediment sections at the drillsite. At the Inuvik Research Center (3 to 4 hours south of the drillsite by ice road), **Bill** recorded timelapse infrared imaging of dissociating gas hydrate, using a custom-made system supplied by **Phil Long** of the Pacific Northwest National Laboratory.

The infrared temperature measurements were part of a pilot program involving **Frank Rack** of Joint Oceano-

graphic Institutions (JOI) and **Bill Gwiliam** (DOE). During a giant-piston-coring cruise in July 2002, researchers will use the French research vessel *Marion Dufresne* to obtain 50-m-long cores from potential gas-hydrate zones in the Gulf of Mexico. During recovery, gas hydrate in the cores will begin to dissociate because of the reduction in pressure and contact with warm gulf surface water and air. It is hoped that infrared measurements of the type obtained in the Arctic will help the Gulf of Mexico researchers quickly pinpoint and preserve sections of the core that may contain gas hydrate (hydrate dissociation, an endothermic reaction, will cool surrounding sediment).

Whole-round gas-hydrate sediment sections were preserved in pressurized vessels for future testing in the Gas Hydrate And Sediment Test Laboratory Instrument (GHASTLI) located at the Woods Hole Field Center. Other members of the Woods Hole gas-hydrate group include **Debbie Hutchinson**, **Bill Dillon**, **Bill Waite**, and **Dave Mason**.

Many of the samples, collected for about 30 different research programs worldwide, have been earmarked for **Tom Lorenson** and **Keith Kvenvolden** (USGS, Menlo Park), who will perform gas-geochemistry analyses on them. **Steve Kirby**, **Laura Stern**, **Susan Cir-**

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(Left to right) **Bill Winters**, **Suzanne Weedman**, **Bennett Raley**, and **Pat Leahy** at the Inuvik Research Center.

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**cone**, and **John Pinkston** (USGS, Menlo Park) will use a scanning electron microscope to perform fabric analyses on the mixtures of gas hydrate and sediment, and they will conduct dissociation tests on samples preserved in liquid nitrogen. **Tom Mroz** (DOE) and **Pete McGrail** (PNNL) will also be determining the properties and dissociation characteristics of preserved sediment samples containing gas hydrate.

**Bennett Raley** (Assistant Secretary of the Interior for Water and Science), **Pat Leahy** (Associate Director for Geology), and **Suzanne Weedman** (USGS Energy Program Coordinator) were among the dignitaries that visited operations at both the drillsite and the Inuvik Research Center. Canadian VIPs included **Peter Harrison** (Deputy Minister of Natural Resources Canada), Assistant



**Tim Collett** (right) shows a piece of gas-hydrate-bonded core to U.S. News and World Report journalist **Tom Hayden** in the science trailer at the Mallik drillsite.

Deputy Ministers **Irwin Itzkovitch** and **Ric Cameron**, and **Jan Boon** (Director General for the Geological Survey of Canada). We were also honored by visits from the president of the Japan Na-

tional Oil Corp. and members of other Japanese organizations involved in the project.

Widespread media coverage involved days of filming by both the Canadian Broadcasting Corp. and SFB, a German broadcasting company, as well as interviews by reporters from Canadian Press (a Canadian wire service similar to the Associated Press) and *U.S. News and World Report*.

The current and previous drilling projects resulted in several scientific and technical accomplishments, discussed in more detail at the following Web sites:

<http://sts.gsc.nrcan.gc.ca/gashydrate/mallik2002/home.asp>

<http://icdp.gfz-potsdam.de/html/sites/mallik/index/index.html>

<http://sts.gsc.nrcan.gc.ca/page1/hydrat/hydrates.html>. ❁

## Recent Flood-Derived Sediment Collected on Moloka'i's Coral Reef

By Michael Casso and Mike Bothner

On February 12 to 18, 2002, participants in the Coastal and Marine Geology Program (CMGP)'s Coral Reef Project from Menlo Park and Santa Cruz, CA (**Hank Chezar**, **Susie Cochran**, **Mike Field** [Project Chief], **Josh Logan**, **Becky Stamski**, and **Curt Storlazzi**), Woods Hole, MA (**Mike Bothner**, **Michael Casso**, and **Rick Rendigs**), and the University of Washington (**Andrea Ogston** and **Kathy Presto**) recovered instruments that monitor oceanographic conditions and sediment resuspension along the 35-mile-long fringing coral reef off the south shoreline of Moloka'i, Hawai'i. One of the primary goals of this multidisciplinary study is to understand the sediment dynamics and to assess the impact of sediment on the health of this coral reef. Land use on Moloka'i has changed in the recent past, and the increased discharge of eroded sediment during infrequent but intense rainfall is a potential threat to the health of the reef. No rain fell during the first 10 months of the instrument deployments; however, kona storms (Hawai'ian storms characterized by strong southerly or south-



Divers **Curt Storlazzi** (USGS and University of California, Santa Cruz) and **Paul Jokiel** (University of Hawai'i) about to retrieve and refurbish the time-series sediment trap located near the coral reef off the south shore of Moloka'i, Hawai'i. Water depth is 10 m. Photograph by **Tom Reiss**.

westerly winds and heavy rain) in November 2001 and January 2002 brought wind and heavy rain from the south-southwest to the normally dry side of Moloka'i. The rain flooded intermittent stream channels, deposited boulders on the coastal highway, and turned the nearshore waters red with land-derived sediment. These pulses of new sediment provide an excellent opportunity to test our hypotheses about sediment-transport processes in this setting.

Two time-series sediment traps were in place for these flood events. Modified for application in this wave-dominated, shallow reef environment, each trap consisted of a 20-cm (inner diameter) x 75-cm cylinder with an internal funnel that directed particles into one of 21 sample bottles. The bottles were on a carousel that rotated a new bottle under the funnel

(Sediment Collected continued on page 4)

## Fieldwork, continued

(Sediment Collected continued from page 3)

at programmed intervals (usually about 5 days) during a typical 100-day deployment. To prevent fish and other organisms from inhabiting the trap, a honeycomb-like baffle with approximately 1-cm-diameter cells was installed in the trap opening. The value of the baffle was demonstrated upon recovery of the support framework that contained an unbaffled pipe. To our surprise, when the framework landed on deck, a small but aggressive moray eel squirmed out of the pipe and nipped one of the scientists as he kindly tried to return it to the ocean. A similar organism living in a trap could alter the sediment composition considerably.

The modular instrument tripod supporting the time-series sediment trap was designed by **Ray Davis** (USGS, Woods

Hole). This design allowed scuba divers to recover only the sampling package for periodic refurbishment. The heavy framework and 300 lb of stainless-steel leg weights remained on the bottom until the final recovery last February. The tripod also accommodated a wave gauge and sensors for turbidity, temperature, and salinity.

The sediment-trap bottles recovered from a study site on the south shore of Moloka'i (10-m water depth) contain drastically different volumes of sediment collected during successive 5-day intervals. The largest volumes, in bottles 3, 12, and 17, accumulated after periods of significant rainfall and large waves, which are known to resuspend sediment at this water depth. Analyses of temporal differences in the chemical and mineralogic composition

of these trap samples, now underway, will help us understand the rates at which new sediment is diluted and removed from this reef system.

The *Alyce C.*, a 28-foot sport-fishing boat owned and operated by **Joe Reich** of Moloka'i, was chartered by the USGS to conduct this fieldwork. **Captain Joe's** extensive knowledge of the reef and his outstanding boat-handling abilities were key factors in four successful deployments and recoveries during the 1-year experiment.✱

*Each sample (below) from the time-series sediment trap was collected for about 5 days between November 15, 2001, and February 14, 2002. The intervals that yielded the three highest sediment volumes coincide with periods of high runoff and large waves.*



## Research

### Where Disease May Mean Good Health— The Role of Parasites in Natural Ecosystems

By **Kevin D. Lafferty**

The ecology of parasites has long had implications for human health, and human alterations to the environment have affected the success of parasites worldwide. Humans have altered the world in ways that favor diseases. For example, deforestation, damming, fish farming, and rice farming have increased malaria transmission by creating mosquito-breeding habitats.

Paradoxically, healthier, less degraded ecosystems tend to have more parasites

with complex life cycles (that is, they pass through multiple hosts to complete their life cycle) than do altered ecosystems, because these parasites depend on functioning ecosystems. The types of change most likely to affect parasite communities are alterations in host communities resulting from climate change and environmental degradation. Environmental degradation can include introduced species, habitat fragmentation, pollution, and overharvest-

ing. In turn, because parasites, particularly those transmitted through predation (when an organism eats an infected host), have the potential to organize their host communities, changes to parasite communities can profoundly alter natural systems.

Recently, the University of California, Santa Barbara (UCSB), was awarded \$2.2 million over the next 5 years by the Na-

*(Role of Parasites continued on page 5)*

## Research, continued

(Role of Parasites continued from page 4)

tional Science Foundation to study the role of parasites in natural ecosystems. The money will largely fund student research under the direction of three coprincipal investigators, all specialists in parasite ecology: **Armand Kuris**, a professor of zoology at UCSB; **Andrew P. Dobson**, a professor of zoology at Princeton; and myself, a marine biologist with the USGS' Western Ecological Research Center and an adjunct professor of biology at UCSB.

Because salt marshes have proved to be a model system for understanding the ecology of parasites with complex life cycles, we will study parasites of the abundant horn snail, *Cerithidea californica*, found in salt marshes. The snail acts as a hub in the life cycle of 17 parasitic trematode (worm) species.

A trematode castrates the snail it infects and each day produces scores of free-swimming stages of offspring that leave infected snails to search out a second, intermediate host, such as a fish, clam, crab, or snail. In the second host, the trematode can greatly alter host behavior to increase the chance of transmission to a final host. Wading birds, shorebirds, and seabirds prey selectively on second, intermediate hosts and become parasitized by adult worms. In the final host, the small worms live in the gastrointestinal tract, mate, and produce eggs that pass into the marsh with



*This free-swimming stage, a trematode cercaria, leaves infected snails to encyst on a fish brain. View is 0.267 mm across. Photograph courtesy of Todd Huspeni, UCSB.*

the host's feces, where they encounter snails and complete their life cycle. Each of the 17 trematode species that use *C. californica* has a different life cycle.

The new research ties in with current research by the USGS and UCSB funded by the U.S. Environmental Protection Agency to develop monitoring tools using parasites to evaluate the health of salt marshes. Mathematical models, molecular tools, laboratory experiments, field experiments, and large-scale comparative field studies will all be used in the investigation. In addition to work at two UCSB natural reserves, Carpinteria Salt Marsh and Coal Oil Point, our research will take us to estuaries in California's Morro Bay and Mugu Lagoon, along the Pacific Coast of Baja California, Mexico, and to Japan. ☼



*Scientists are studying wetlands to find better ways to assess their condition. Are these sites as healthy as they are beautiful? Top, Shark Inlet, Morro Bay, CA. Bottom, Devereux Lagoon, near Santa Barbara, CA. Photographs by Kevin Lafferty, USGS.*

## Outreach

### Heads or Tails? USGS Contractor Participates in Public Art Project

By Susan S. Horton

USGS contractor **Carey Hamburg**, who does photography, videography, and Web-site work at the National Wetlands Research Center (Lafayette, LA), was featured recently in the *Times of Acadiana* article "Faces to Watch." **Carey** was noted for his artistic contribution to the Pelicans on Parade public art project, similar to projects that displayed cow statues in Chicago and fish statues in New Orleans. The program features nearly 100 4-ft-tall fiberglass pelican statues that have been "nested" throughout the Lafayette area.

Local artists uniquely painted each pelican. **Carey** created a Mardi Gras pelican and one representing a hot-and-spicy red crawfish, a local Cajun delicacy from the Louisiana wetlands. Part of the sponsorship money from each pelican will go to local arts-in-education programs. ☼

*Taking artistic license, **Carey Hamburg** (shown here with his creative crustacean) transformed the fiberglass pelican into a hot-and-spicy red crawfish, a.k.a. mudbug.*



## USGS and Students Restore Disappearing Prairie

By Susan S. Horton

The Louisiana coastal-prairie ecosystem once contained 2.5 million acres; today it covers less than 100 acres. Wiped out mostly by farming and grazing, this ecosystem once boasted 500 species of grasses and perennial wildflowers and was home to bison, antelope, prairie chickens, and mountain lions, among other species. USGS botanist **Larry Allain** (National Wetlands Research Center, Lafayette, LA) is heading up a joint prairie-restoration project between the University of Louisiana, Lafayette (ULL)'s chapter of AmeriCorps and the USGS' National Wetlands Research Center. Recently, AmeriCorps volunteers relocated 5,000 ft<sup>2</sup> of endangered prairie grasses, such as big bluestem grass and Indian grass, to a site at the ULL's Center for Ecology and Environmental Technology (CEET). The relocation was necessary to save as many species as possible before this section of prairie is cleared to make way for a four-lane highway. At CEET, this "refuge" of cultivated coastal-prairie species will be used for research, restoration, and education. **Larry** hopes that enough of the prairie can be planted so that eventually sufficient seed can be produced to make it practical to restore large areas of this imperiled ecosystem. For more information, visit the Cajun Prairie Habitat Preservation Society's Web site at URL <http://www.cajunprairie.org> ♻️



*AmeriCorps volunteers from the University of Louisiana at Lafayette dig up grasses and perennials from a remnant of the coastal prairie that will be destroyed to make room for a four-lane highway.*



*With the guidance of USGS researchers, AmeriCorps volunteers prepare the ground for planting of endangered prairie grasses and wildflowers at the University of Louisiana, Lafayette's Center for Ecology and Environmental Technology.*

## Marine Science Day in St. Petersburg Sparks Children's Interest

By Georgia De Stoppelaire

**James Kostka** of The Canterbury School of Florida organized Marine Science Day on March 1 for the school's youngsters from kindergarten through second grade and invited the USGS to participate in the day's activities. About 120 children in groups of 10 to 12 visited various science displays set up in the school's courtyard in St. Petersburg, FL.

**Georgia De Stoppelaire** and **Noreen Buster** (USGS, St. Petersburg) took part in the outreach event. They presented

**Georgia's** research project, which uses NASA lidar (light detection and ranging) surveys to study the effects of nonnative horse grazing on American beachgrass and the resulting impact on coastal geomorphology at Assateague Island, USA.

Assateague Island is a barrier island approximately 57 km long. The south third of the island is in Virginia, and the north two-thirds in Maryland. Wild horses roam the island in two main herds, one on the Virginia side and one on the Maryland

side. Once a year, the horses are rounded up, and most of the foals are auctioned off to control the size of each herd and lessen their impact on island ecology.

**Georgia** and **Noreen's** presentation included posters and a miniature barrier-island display with fenced experimental plots, toy horses, sand, and turfgrass. **Georgia** used a toy helicopter and laser pointer to help the youngsters understand

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the concept of lidar surveying, which uses laser light shot from an aircraft to make detailed measurements of topography. The children were intrigued, and the presentation sparked interest and many questions. To end the presentation, **Noreen** and **Georgia** gave a coloring book to each child, compliments of the Southwest Florida Water Management District. As the afternoon's naptime approached, we don't know who was more exhausted—the children or **Noreen** and **Georgia**! All in all, the big event was quite a success for the little ones. ☼



**Noreen Buster** (left) and **Georgia De Stoppelaire** (right) educate young students about coastal processes, NASA lidar technology, and the effects of horse grazing on Assateague Island.



**Georgia De Stoppelaire** demonstrates NASA lidar technology and how it is used to detect horse-grazing effects on coastal geomorphology at Assateague Island.

## 2002 Marine Environmental Careers Symposium in Woods Hole, MA

By **Chris Polloni** and **Erika Hammar-Klose**

The Woods Hole Field Center (WHFC) contributed to the Eighth Annual Massachusetts Maritime Academy (MMA)—New England Aquarium High School Environmental Symposium. The event was held on the shores of MMA's Cape Cod Canal campus (Buzzard's Bay, MA) on March 1 and 2 under the direction of **Christopher Ryan** and **Fuji Fulgueras**, the MMA symposium coordinators. Busloads of 300 students and teachers departed for behind-the-scenes tours of the New England Aquarium and the Woods Hole scientific community as part of the 2-day symposium. **Chris Polloni** (WHFC) organized the field trip in Woods Hole. He led students and teachers to the first stop on the field trip, Chappaquoit Beach in West Falmouth, where box lunches were enjoyed on the sand in a very brisk wind.

**David Radosh** of the National Oceanic and Atmospheric Administration (NOAA)'s National Marine Fisheries Service (NMFS) made NOAA's Woods Hole Science Aquarium available for a tour. The animals in the aquarium are representative of the populations on Stellwagen Bank. **Anne Smrcina** (NOAA), of the Stellwagen Bank National Marine Sanctuary (SBNMS), and **Erika Hammar-Klose** (WHFC) provided an overview of the biologic surveys and geologic mapping that are being accomplished as part of the joint-agency research on the bank. **Anne**

provided a quiz list for the students to use as they identified the critters in the tanks. **David** provided tours of the work areas behind the display tanks, where the students were able to handle some of the critters, including a newly molted lobster.

**Erika** discussed her experiences with a career in marine geology, and she de-



**Erika Hammar-Klose** delivers a talk to high-school students about sea-floor mapping and careers in ocean sciences.



**Fausto Marcicioni** presents facts about the Marine Realms Information Bank.

scribed the USGS' efforts in mapping and interpreting the sea-floor ecosystem, specifically Stellwagen Bank. The visiting students were keenly interested in **Erika's** career path, from her entering college as an art major to her ending up as a member of the sea-floor mapping group in Woods Hole. **Erika** described the tools that the USGS uses to map the sea floor, the different types of data the USGS collects, and what data products result from the research. The students asked many questions about who uses USGS data and what other applications there are for the technology (finding buried treasure?). The students showed great curiosity about internship and career opportunities with the USGS, and other jobs in the marine sector.

On the following day, **Fausto Marcicioni** (WHFC) gave a briefing on the Marine Realms Information Bank (MRIB; see URL <http://mrrib.usgs.gov>). **Chris Polloni** provided an overview of information systems designed to deliver marine environmental data on the USGS' World Wide Web site and his experience with publishing USGS CD-ROMs. Maps from the Historic Remediation Site (HARS) offshore of New York City, Stellwagen Bank, and the Gulf of Maine were on display as part of the demonstration. **Fausto** used the MRIB to demonstrate how to find information on the HARS project. ☼

## Environmental Science Students Visit the Woods Hole Field Center

By Chris Polloni

On March 1, the environmental-science class from Essex Agricultural School (Essex, MA) paid a visit to the Woods Hole Field Center (WHFC) to learn more about the Stellwagen Bank mapping team, including **Page Valentine**, **Sarah Fuller**, and **Kara Hass**. **Chris Polloni** and **Erika Hammar-Klose** were present to answer questions about sea-floor-mapping applications. **Amy Holt Cline** and **Charles Saulnier** brought 12 students, who had created maps of marine regions.

**Page Valentine** fielded questions from the students and gave them an overview of the research. The students had the chance to give a quick summary of the products that they had created using the Marine GIS Library for Massachusetts

Bay (Open-File Report 99-439, <http://pubs.usgs.gov/openfile/of99-439>) as a resource. The students used ESRI (Environmental Systems Research Institute) ArcView software to navigate through the CD and told a story through the map images. The mapping team was impressed with the products, and plans for continued collaboration are being made. The class also participated in the Massachusetts Maritime Academy (MMA) High School Environmental Symposium (see previous article).✿



(Left to right across front of room) **Erika Hammar-Klose**, **Page Valentine**, **Sarah Fuller**, and **Kara Hass** discuss mapping in Stellwagen Bank with students from the Essex Agricultural School's environmental-science class.

## USGS Scientist Speaks to Congressional Staff About Wetlands

By Susan S. Horton

USGS scientist **Virginia Burkett** from the National Wetlands Research Center (Lafayette, LA) presented a talk about the status and values of wetlands to 30 senior Congressional staff members on Tuesday,

March 26, 2002, at the Airlie Conference Center in Warrenton, VA. The presentation was part of an annual 2-day education program for Congressional staff that was sponsored by Harvard University. The

conference this year was entitled "Global Environmental Change: The Science and Human Health Impacts."✿

## Woods Hole Field Center Scientists Participate in Science Fairs

By Becky Deusser

Several scientists from the Woods Hole Field Center (WHFC) participated as judges in local science fairs for Falmouth and Mashpee Public Schools (Falmouth and Mashpee, MA) and Falmouth Academy

(Falmouth, MA). Judges were tasked with interviewing students and ranking them according to their awareness of scientific procedures. The judges enjoyed learning about interesting projects and interacting

with the students. Participants included **VeeAnn Cross**, **Chuck Denham**, **Debbie Hutchinson**, **Marinna Martini**, **Ellen Mecray**, **Kathy Scanlon**, **Bill Waite**, and **Richie Williams**.✿

## Richie Williams Delivers Talks for DOE and the College of William and Mary

By Richie Williams

**Richie Williams** (Woods Hole Field Center) was invited to present two lectures at the U.S. Department of Energy's Thomas Jefferson National Accelerator Facility (Newport News, VA) on February 28, 2002. The first talk was a colloquium

lecture to the staff entitled "The Earth's Cryosphere and Global Environmental Change." This presentation was followed by a public lecture entitled "Iceland: Dynamic Land of Fire and Ice." On the following day, **Richie** gave the "Earth's

Cryosphere" lecture to two undergraduate classes in the Department of Geology at the College of William and Mary (Williamsburg, VA).✿

## USGS Sediment-Transport Researchers Collaborate with Colleagues in The Netherlands or Researchers Go Dutch

By Chris Sherwood

The Netherlands leads the world in coastal engineering, and for good reason. Parts of Holland are 6 m below sea level, and a recently passed national law declares that the configuration of the coast and beaches in 1990 will be maintained in perpetuity, despite predictions of sea-level rise. Delft, an old town about 10 km from The Hague, is one of the most renowned centers for coastal engineering in Europe, with a leading technical university and the WL/Delft Hydraulics Laboratory. USGS Coastal and Marine Geology Program researchers **Guy Gelfenbaum**, **Jessie Lacy**, and **Peter Ruggiero** (Menlo Park) and **Chris Sherwood** (Woods Hole) were lucky to arrange an extended visit to Delft through a cooperative agreement with Delft Hydraulics. They were graciously hosted by **Dano Roelvink** and **Dirk-Jan Walstra**, with wonderful logistical support from **Marcia de Jonge**. Delft Hydraulics provided a conference room, network access, and bikes for commuting (the only way to go in Holland; see photo), and helped the researchers locate an apartment at the Beestenmarkt, a centuries-old area featured in the recent novel *Girl with a Pearl Earring* (after the painting by Vermeer).

In nearly 3 weeks of collaborative work, the USGS scientists and their hosts



USGS researchers (left to right) **Guy Gelfenbaum**, **Peter Ruggiero**, **Jessie Lacy**, and **Chris Sherwood** with their host **Dano Roelvink** in front of the water clock at Delft Hydraulics Laboratory.

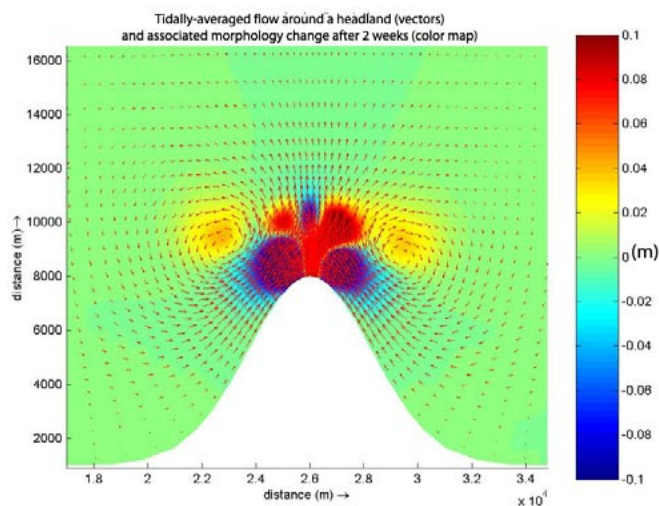


A large proportion of Delft's citizens commute by bicycle, and **Chris Sherwood** is happy to follow the trend. Here he passes through the *Oost Poort* (gate through the old Delft wall) and over the *Zuider Gracht* canal.

applied state-of-the-art numerical models of waves, flow, and sediment transport to USGS projects. **Jessie** is applying a three-dimensional model to evaluate circulation and suspended-sediment transport near the entrance to Grays Harbor, WA. **Peter** is focussed on shoreface evolution at Ocean Shores and Long Beach, WA, both part of the Columbia River littoral cell. **Guy** is continuing to work on morphologic change near Grays Harbor with **Mathijs Meijs**,

a student from Delft who worked in Menlo Park, CA, this winter (see article in February 2002 *Sound Waves*). **Guy** is also beginning a project to evaluate the long-term evolution of morphology at the entrance to Willapa Bay, WA. **Chris** is using Delft3D, modeling software from Delft Hydraulics, to develop test cases for comparison and evaluation of sediment-transport models.

In addition to the benefits of a remarkably productive and collaborative work environment, the USGS researchers engaged in informal hallway or lunchroom conversations with such coastal-process legends as **Leo van Rijn**, **Jurgen Battjes**, **Huib de Vriend**, and **Marcel Stive**. On weekend trips, the learning process continued as they alternated visits to great museums with trips to the beaches and coastal defenses of Holland. The knowledge and experience they bring back to the USGS will be applied to Coastal and Marine Geology Program studies of coastal erosion, coastal evolution, and sediment transport. ❁



Delft3D model results. Map of tidally averaged and depth-averaged flow around a headland and associated morphology change after a 2-week simulation.

## USGS Sediment-Transport Modeling Highlighted at Ocean Sciences Meeting

By Chris Sherwood

USGS activities in coastal-sediment-transport modeling were highlighted at the recent Ocean Sciences Meeting in Honolulu, Hawai'i, sponsored jointly by the American Geophysical Union (AGU) and the American Society of Limnology and Oceanography (ASLO). **Chris Sherwood** (Woods Hole, MA) and **Courtney Harris** (former USGS postdoctoral fellow at Woods Hole) were co-convenors for a special scientific session on "Application and Assessment of Coastal Sediment Transport Models," featuring nearly 40 presenta-

tions from scientists around the world. The USGS (**Sherwood**) and the Woods Hole Oceanographic Institution (**Rocky Geyer**) also hosted a Town Meeting to promote and discuss the ongoing development of community models. This meeting was part of a joint National Oceanographic Partnership Program (NOPP) grant, and linked to the USGS' National Community Sediment-Transport Model Project (see URL <http://woodshole.er.usgs.gov/project-pages/sediment-transport/>). The goal of the Town Meeting was to report on prog-

ress toward a community model, engage the wider community of interested scientists in the project, and continue open discussion of technical issues. **John Warner** (USGS Mendenhall postdoctoral fellow at Woods Hole), **Dano Roelvink** (Delft Hydraulics), and **Pravi Shrestha** (HydroQual, Inc.) presented results of model tests and comparisons. The meeting was well attended and a great success, thanks in part to logistical coordination by **Soupy Alexander** (USGS, Woods Hole).✻

## USGS Managers Tour the Tampa Bay Estuary in Florida

By Noah Silverman

On January 30, 50 managers and scientists attending the USGS Geologic Discipline (GD) managers meeting in St. Petersburg, FL, set out on a field trip to observe the Gulf of Mexico Estuaries Integrated Science Pilot Study in action. **Holly Greening**, Senior Scientist of the Tampa Bay Estuary Program (a partnership of agencies and local governments), gave introductory remarks. **Holly** and her team of more than 150 scientists have worked with elected officials to establish long-term restoration and protection goals for natural resources in Tampa Bay. **Holly** spoke about the importance of the USGS' role as a long-term partner to fill tactical gaps in bay research. The managers then boarded a 54-ft catamaran and cruised to the Bishop Harbor area along the bay's south shore. During the transit, **Mike Crane** of the EROS Data Center in Sioux Falls, ND, briefly spoke about urban growth and significant changes in land cover and land-use practices over the past 50 years. He described the USGS' highly advanced computer technology in the predictive modeling of future population growth in the Tampa Bay watershed.

The first stop was Mariposa Key, a relatively undisturbed stretch of shoreline in southeastern Tampa Bay where



*Managers and scientists ride a 54-ft catamaran to the Bishop Harbor area along Tampa Bay's south shore.*

important studies are underway. Scientists had set up exhibits in shallow water along the mangroves to describe their activities. Separated into groups, the managers were escorted through knee-deep water to each of the five sta-

tions, where they heard lectures and saw equipment demonstrations. **Peter Swarzenski** (GD, St. Petersburg) and **Dan Yobbi** (USGS, Water Resources,

*(Tampa Bay Estuary Tour continued on page 11)*

## Meetings, continued

(Tampa Bay Estuary Tour continued from page 10)

Tampa) presented their understanding of physical processes at the sediment-water interface. They demonstrated the use of piezometers in sampling ground water. **Terry Edgar** (GD, St. Petersburg) and **Greg Brooks** (Eckerd College, St. Petersburg) discussed their analysis of the geologic record of Tampa Bay. They showed how a vibracorer was an essential tool for obtaining sediment cores in shallow parts of the estuary; they displayed cores and led discussions of their interpretations of the strata.

**Wendy Weaver** (University of Georgia, Athens), an archeologist, discussed her analysis of Indian middens (shell mounds) located throughout the Mariposa Key area and showed several shell artifacts to the group. Understanding the prehistoric deposits is an important aspect in defining the history of sea-level change in the bay area. **Kim Yates** (GD, St. Petersburg) demonstrated her submersible habitat for analyzing reef quality (SHARQ). The clear tent traps water over a reef (or seagrass bed in this instance) but allows sunlight to reach the bay floor. Use of submersible probes and sophisticated data loggers permits measurement and recording of photosynthesis and carbon fixation. Through successive deployments, **Kim** is assessing the relative quality of different marine habitats in Tampa Bay.

Before the group left Mariposa Key, Tampa Bay Aquatic Preserve manager **Randy Runnels** outlined the long-term commitment of the Florida Department of Environmental Protection (DEP) to preserve and restore upland and aquatic habitats throughout the bay. Next, participants took a short catamaran trip into Cockroach Bay, after which they were bussed to the Terra Ceia Aquatic and Buffer Preserve.

This part of the field trip showcased research on wetland ecology. **Carole McIvor** (USGS, Biological Resources, St. Petersburg) discussed how the composition of fish faunas of selected mangrove-lined karst ponds could be directly linked to hydrologic modifications made by mosquito ditching 40 years previously. She exhibited several species of estuarine forage fishes captured from one such pond and discussed how pond conditions might change when mosquito ditches are filled, which is part of the restoration plan. **Tom Smith** (USGS, Biological Resources, St. Petersburg), a mangrove ecologist, gave an overview of his vegetation analysis. He explained the use of permanent vegetation plots as a tool for collecting data on biomass, mortality rate, and growth rate for mangrove trees. **Sarah Kruse** (University of South Florida, Tampa) illustrated how resistivity measurements have been used at Terra Ceia to assess



**Carole McIvor** displays estuarine forage fishes and discusses how conditions in their ponds might change when mosquito ditches are filled.

ground conductivity and to infer the salinity of underlying ground water.

At the trip's end, scientists and managers boarded buses for a short ride back home. Their brief tour of Tampa Bay could showcase only a small part of the extensive research that is being performed and that is planned. Understanding the processes within one of the largest estuaries on the Gulf of Mexico is an enormous undertaking that requires the collaboration of numerous disciplines, research agencies, and academia. The managers were shown a glimpse of the diverse scientific elements that have been integrated as a resource for restoration and management of the Tampa Bay estuary. ❁



Managers wade to scientific exhibits at Mariposa Key.



**Tom Smith** gives an overview of his vegetation analysis.

## Steve Eittreim Receives Monterey Bay National Marine Sanctuary Award for Science/Research

By Helen Gibbons

**Steve Eittreim** (Menlo Park, CA) received this year's Monterey Bay National Marine Sanctuary Award for Science/Research. This is one of several awards presented yearly by the Monterey Bay National Marine Sanctuary and the Association of Monterey Bay Area Governments (AMBAG) to people and organizations that have contributed greatly to the implementation of programs geared toward meeting the goals of the sanctuary. (Last year, the USGS won the sanctuary's award in the Organization category; see March 2001 issue of *Sound Waves*.)

The awards were presented at the Ninth Annual Sanctuary Awards ceremony held at California State University, Monterey Bay, on March 9, 2002. The program notes, quoted here, explain why **Steve** was honored with this year's Science/Research award:

"**Dr. Steve Eittreim** has recently completed a multiyear USGS study of the geology and geologic processes of Monterey Bay National Marine Sanctuary. **Steve** provided leadership and coordination of

a large group of geologists, oceanographers, and sedimentologists investigating a spectrum of research topics ranging from regional current structure to sea-floor mapping to coastal retreat. He also participated in numerous cruises and individual studies of his own. His research has contributed markedly to maps of the sanctuary and a new understanding of sediment distribution and processes on the sea floor. A hallmark of the effort that he led is the publication of a CD with maps and data [Wong, F.L., and Eittreim, S.L., Continental Shelf GIS for the Monterey Bay National Marine Sanctuary: U.S. Geological Survey Open-File Report 01-179, version 1.0; see article in August 2001 issue of *Sound Waves*] and a forthcoming special issue of the journal *Marine Geology* which will detail the research investigations of USGS scientists and collaborators over the past 5 years. Both of these products will be useful for years to come to all researchers in the Monterey Bay community."



**Steve Eittreim** expresses his appreciation upon receiving this year's Monterey Bay National Marine Sanctuary Award for Science/Research. Photograph courtesy of the Monterey Bay National Marine Sanctuary.

### Staff and Center News

## St. Petersburg Field Center Hosts Visit from Japanese Land-Management Team

By Dennis Krohn

**Fuminori Kato** and **Koji Yamamoto** from the National Institute for Land and Infrastructure Management in Japan visited the USGS' Center for Coastal and Regional Marine Studies (CCRMS) in St. Petersburg, FL, on March 25 and 26. They were here to attend the Association of State Flood Plain Managers meeting in Tampa and had a few extra days. **Jack Medlin** (USGS, International Programs, Reston, VA) arranged a tour of our facility. **Mr. Kato** and **Mr. Yamamoto** were especially interested in how the USGS deals with coastal-erosion issues on a populated beach. We took them on a field trip to visit developed and undeveloped beaches along Pinellas County. Thanks to **Bob**



**Fuminori Kato, Koji Yamamoto, Steve Obrochta, Greg Brooks, and Bekka Larsen** (left to right) gather at Fort De Soto Park for a field trip to undeveloped beaches.

**Halley, Bob Morton, John Brock, Terry Edgar, Abby Sallenger, and Russ Peterson** from the USGS, **Steve**

**Obrochta** from the University of South Florida, and **Greg Brooks** and **Bekka Larsen** from Eckerd College for helping introduce them to our facilities. Some of their publications are:

Kato, Fuminori, Sato, Shinji, and Yeh, Harry, 2000, Large-scale experiment on dynamic response of sand bed around a cylinder due to tsunami, in Edge, Billy L., ed., Coastal Engineering 2000, Proceedings of the 27th International Conference on Coastal Engineering, Sydney, Australia, July 16-21, 2000: American Society of Civil Engineers (ASCE), p. 1848-1859.

(Visit continued on page 13)

(Visit continued from page 12)

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Uda, Takaaki, and Yamamoto, Koji, 1992, Beach changes around a sand spit—the example of Mihono-Matsubara: Coastal Engineering in Japan, v. 35, no. 1, p. 111-128.

Uda, Takaaki, and Yamamoto, Koji, 1994, Beach changes caused by obstruction of longshore sand transport; an example of the Hidaka Coast in Hokkaido: Coastal Engineering in Japan, v. 37, no. 1, p. 87-106.✱



**Koji Yamamoto and Fuminori Kato** waded into the lagoon between Fort De Soto and Hook Island to do fieldwork at Fort De Soto.



**Russ Peterson** demonstrates use of the All Terrain Vehicle for beach mapping to **Fuminori Kato**.

**Steve Obrochta and Koji Yamamoto** look at grain sizes at a Fort De Soto Park beach.



## Triple-Header Retirement Party in Western Region

By Florence Wong

**Peter Barnes, Jim Bischoff, and Alan Cooper** were feted by the Western Region Coastal and Marine Geology (WRCMG) team at Ming's Restaurant in Palo Alto, CA, on February 21, 2002, to celebrate their retirements after a combined 104 years of service to the USGS. **Steve Eittreim** reviewed **Peter Barnes'** impact on Arctic marine processes and **Peter's** recognition in the research and outreach arenas. **Bob Rosenbauer** discussed key discoveries that **Jim Bischoff**, a WRCMG alumnus, made in geochemistry of marine and terrestrial environments. **Dave Scholl** and **Jon Childs** detailed **Alan Cooper's** long interest in high latitudes in both hemispheres—the Bering Sea and Antarctica—and his role as shepherd of the Antarctic Seismic Data Library.

**Homa Lee** and **Terry Bruns** presented the honorees with gift certificates and in-



Western Region retirees (from left to right) **Peter Barnes, Jim Bischoff, and Alan Cooper** attend a luncheon in their honor. Photograph by **Stephanie Ross**.

scribed plaques decorated with USGS benchmarks. Because retirement can be viewed as another field activity, the retirees were outfitted with special copies of field-activity col-

lection-system (FACS) notebooks assembled by **Clint Steele, Carolyn Degnan, and Florence Wong**.

As is commonly the case, long-buried stories emerged for good or ill. We learned that **Alan Cooper** created havoc on board the research vessel *S.P. Lee* in 1984 when he collected an oversize boulder in Antarctica that got loose on the *Lee's* deck in rough seas. After 35 years, **Jim Bischoff** explained to **Harry Cook** that the abortive explosion of **Harry's** experiment in a UC Berkeley laboratory when they were both grad students was an accident. **Steve Eittreim** recounted a harrowing first sail with **Peter Barnes** from Santa Cruz to San Francisco.

About 50 WRCMG team members and guests attended to wish the retirees well at the event, which was efficiently organized by **Anne Gartner** and **Terry Bruns**.

## Bruce Buffet Visits Woods Hole

By Becky Deusser

**Bruce Buffet**, a professor in the Earth and Ocean Sciences Department at the University of British Columbia, Vancouver, Canada, was a guest lecturer this month for a Geodynamics Seminar offered at the Woods Hole Oceanographic

Institution. He delivered a talk about gas-hydrate stability. During his visit, **Bruce** met with the members of the Woods Hole Field Center (WHFC)'s Gas Hydrates group (**Bill Dillon, Debbie Hutchinson, and Bill Waite**) to discuss their ongoing

projects and to tour the Gas Hydrate And Sediment Test Laboratory Instrument (GHASTLI) facilities at WHFC.✱

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